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## Search History

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☐ 1. Document ID: US 6382098 B2

L5: Entry 1 of 3 File: USPT May 7, 2002

DOCUMENT-IDENTIFIER: US 6382098 B2
TITLE: Coating apparatus, printing apparatus, imaging apparatus, printing system and printing method

US PATENT NO. (1):
6382098

Brief Summary Text (66):
According to another embodiment of the present invention, there is provided a coating apparatus comprising: a coating roller with an elastic surface; and a doctor blade, configured to move back and forth freely to the outer peripheral surface of the coating roller, for controlling the thickness of coated film formed on the outer peripheral surface, wherein the coating roller is formed of a non-elastic rotation shaft and an elastic member having a multilayer structure in which at least an uppermost surface layer wrapping the rotation shaft is formed of polyurethane, and hardness of each elastic layer of the elastic member of the coating roller becomes higher than an inner layer as approaching to the surface layer.

Detailed Description Text (44):
For that reason, the form roller 1201 having the multilayer structure in which the hardness of the surface layer is set higher than that of the inner layer may be preferably used. Preferably, the uppermost surface layer is at least polyurethane rubber, and more preferably the respective layers may be polyurethane rubber.

Detailed Description Text (46):
The reason why polyurethane rubber is used is as follows:

Detailed Description Text (47):
Polyurethane rubber is rich in elasticity and toughness, and has high tear strength and good abrasion resistance. Due to this, polyurethane rubber has a good dimensional stability at the time of friction between the form roller and the doctor blade, so that the thickness of the coated ink film can be maintained constant. Also, polyurethane rubber has a considerable low content of plasticizer as compared with nitrile rubber or the like, which is generally used in the printing apparatus. The change of the rubber hardness, which is caused when plasticizer in rubber is extracted, is small. Moreover, by use of the multilayer in which the hardness of the surface layer is set higher than that of the inner layer, polyurethane rubber can largely reduce the striped defects due to paper dust as compared with the single layer.

Detailed Description Text (48):
If all layers are formed of polyurethane rubber, abrasion of the roller surface is small. As a result, the change in the thickness of the coated ink film is low even if the roller is used for a long period of time. By use of the multilayer in which the hardness of the surface layer is set higher than that of the inner layer, the generation of the striped defects due to paper dust is low, and plasticizer in rubber is not extracted, so that the change in the rubber hardness is small. Therefore, the use of polyurethane rubber is favorable since good coating conditions can be maintained for a long period time.

Detailed Description Text (49):
In the above-mentioned ink unit, since the form roller 1201 and the doctor blade 1202

rub on each other through the ink layer, the form roller 1201 is easily worn. The wear of the form roller 1201 increases as the surface hardness of the form roller 1201 decreases. Also, the quantity of heat at the portion of the form roller 1201 increases, and ink temperature rises, with the result that they have an unfavorable influence on the printing conditions. In the single layer of polyurethane rubber had a disadvantage in which the surface hardness of the form roller could not be highly increased because of the limitation of hardness. In contrast, when the form roller is formed of the multilayer structure, the condition in which no striped defects are generated can be prepared by reducing the hardness of the inner layer even if the surface hardness of the uppermost layer is set to 50.degree. or more, which cannot be used in the single layer. As a result, the form roller can be used without any problem.

Detailed Description Text (50):
In the form roller 1201 of polyurethane rubber, it is required that the engagement with the doctor blade 1202 be maintained constant. For this reason, there is favorably used an elastic structure in which the form roller is immediately returned to the original state from the deformed state. A foaming structure, which needs much time to return to the original state from the deformed state, is not favorable.

Detailed Description Text (51):
The present invention obtained the above-mentioned good advantages by using the polyurethane rubber of the multilayer structure, which was conventionally difficult to be manufactured.

Detailed Description Text (52):
As polyurethane rubbers that can be used in the present invention, there are UV Summit by Meiwa Rubber Industrial Co., Ltd, Uron H by Kinyousha Co., Ltd. New UV by Kanuki Roller Works, Col, Ltd, etc.

Detailed Description Text (195):
As the conditions of the rollers and the blade, two-layer polyurethane rubber roller having the outer layer rubber hardness of 40.degree., the inner layer rubber hardness of 25.degree., and the outer diameter of 59.5 mm was used as the form roller 1201. One-layer polyurethane rubber roller having the rubber hardness of 35.degree., the outer diameter of 30.2 mm was used as the auxiliary form rollers 1212, 1213. The Rilsan roller having the outer diameter of 19.6 mm was used as the ink distributing rollers 1210, 1211.

Current US Cross Reference Classification (2):
101/217



2. Document ID: US 6227109 B1

L5: Entry 2 of 3 File: USPT May 8, 2001

101 217 183

DOCUMENT-IDENTIFIER: US 6227109 B1
TITLE: Multicolor printing apparatus with horizontally rotatable discharge station

US PATENT NO. (1):
6227109

Brief Summary Text (66):
According to another embodiment of the present invention, there is provided a coating apparatus comprising: a coating roller with an elastic surface; and a doctor blade, configured to move back and forth freely to the outer peripheral surface of the coating roller, for controlling the thickness of coated film formed on the outer peripheral surface, wherein the coating roller is formed of a non-elastic rotation shaft and an elastic member having a multilayer structure in which at least an uppermost surface layer wrapping the rotation shaft is formed of polyurethane, and hardness of each

elastic layer of the elastic member of the coating roller becomes higher than an inner layer as approaching to the surface layer.

Detailed Description Text (45):
For that reason, the form roller 1201 having the multilayer structure in which the hardness of the surface layer is set higher than that of the inner layer may be preferably used. Preferably, the uppermost surface layer is at least polyurethane rubber, and more preferably the respective layers may be polyurethane rubber.

Detailed Description Text (47):
The reason why polyurethane rubber is used is as follows:

Detailed Description Text (48):
Polyurethane rubber is rich in elasticity and toughness, and has high tear strength and good abrasion resistance. Due to this, polyurethane rubber has a good dimensional stability at the time of friction between the form roller and the doctor blade, so that the thickness of the coated ink film can be maintained constant. Also, polyurethane rubber has a considerable low content of plasticizer as compared with nitrile rubber or the like, which is generally used in the printing apparatus. The change of the rubber hardness, which is caused when plasticizer in rubber is extracted, is small. Moreover, by use of the multilayer in which the hardness of the surface layer is set higher than that of the inner layer, polyurethane rubber can largely reduce the striped defects due to paper dust as compared with the single layer.

Detailed Description Text (49):
If all layers are formed of polyurethane rubber, abrasion of the roller surface is small. As a result, the change in the thickness of the coated ink film is low even if the roller is used for a long period of time. By use of the multilayer in which the hardness of the surface layer is set higher than that of the inner layer, the generation of the striped defects due to paper dust is low, and plasticizer in rubber is not extracted, so that the change in the rubber hardness is small. Therefore, the use of polyurethane rubber is favorable since good coating conditions can be maintained for a long period time.

Detailed Description Text (50):
In the above-mentioned ink unit, since the form roller 1201 and the doctor blade 1202 rub on each other through the ink layer, the form roller 1201 is easily worn. The wear of the form roller 1201 increases as the surface hardness of the form roller 1201 decreases. Also, the quantity of heat at the portion of the form roller 1201 increases, and ink temperature rises, with the result that they have an unfavorable influence on the printing conditions. In the single layer of polyurethane rubber had a disadvantage in which the surface hardness of the form roller could not be highly increased because of the limitation of hardness. In contrast, when the form roller is formed of the multilayer structure, the condition in which no striped defects are generated can be prepared by reducing the hardness of the inner layer even if the surface hardness of the uppermost layer is set to 50.degree. or more, which cannot be used in the single layer. As a result, the form roller can be used without any problem.

Detailed Description Text (51):
In the form roller 1201 of polyurethane rubber, it is required that the engagement with the doctor blade 1202 be maintained constant. For this reason, there is favorably used an elastic structure In which the form roller is immediately returned to the original state from the deformed state. A foaming structure, which needs much time to return to the original state from the deformed state, is not favorable.

Detailed Description Text (52):
The present invention obtained the above-mentioned good advantages by using the polyurethane rubber of the multilayer structure, which was conventionally difficult to be manufactured.

Detailed Description Text (53):
As polyurethane rubbers that can be used in the present invention, there are UV Summit by Meiwa Rubber Industrial Co., Ltd, Uron H by Kinyousha Co., Ltd, New UV by Kanuki Roller Works, Col, Ltd, etc.

Detailed Description Text (196):
As the conditions of the rollers and the blade, two-layer polyurethane rubber roller having the outer layer rubber hardness of 40.degree., the inner layer rubber hardness of 25.degree., and the outer diameter of 59.5 mm was used as the form roller 1201.

One-layer polyurethane rubber roller having the rubber hardness of 35.degree., the outer diameter of 30.2 mm was used as the auxiliary form rollers 1212, 1213. The Rilsan roller having the outer diameter of 19.6 mm was used as the ink distributing rollers 1210, 1211.

Current US Cross Reference Classification (2):
101/217



☐ 3. Document ID: US 5797322 A

L5: Entry 3 of 3 File: USPT Aug 25, 1998

DOCUMENT-IDENTIFIER: US 5797322 A
TITLE: Printing sleeve for a flexographic or gravure printing roll

US PATENT NO. (1):
5797322

Brief Summary Text (28):
In an embodiment the layer of compressible material that is disposed over the base sleeve is fabricated from polyurethane.

Brief Summary Text (29):
In an embodiment the layer of compressible material that is disposed over the base sleeve is fabricated from polyurethane and further has a high impact resistance.

Brief Summary Text (36):
In an embodiment, the layer of foam material is fabricated from polyurethane with high compressive strength.

Brief Summary Text (40):
In an embodiment, the layer of casting compound is a layer of polyurethane casting compound.

Brief Summary Text (41):
In an embodiment, the layer of polyurethane casting compound has a density of about 1.2 g/cm.sup.3.

Brief Summary Text (42):
In an embodiment, the layer of polyurethane casting compound has a Shore D hardness of about 75.

Detailed Description Text (4):
In a preferred embodiment, the layer 2 of compressible material that is disposed over the base sleeve 1 is fabricated from polyurethane that has a high impact resistance, a wall thickness ranging from about 1.5 mm to about 2.0 mm, a density of about 0.4 g/cm.sup.3, a permanent set of about 3%, a Shore A hardness of about 40, and is further characterized as being resistant to solvents and standard ink constituents.

Detailed Description Text (5):
In a preferred embodiment, the layer 3 of foam material is fabricated from polyurethane with high compressive strength, and a density of about 0.15 g/cm.sup.3.

Detailed Description Text (6):
In a preferred embodiment, the layer 4 of casting compound is a polyurethane casting compound with a density of about 1.2 g/cm.sup.3, a Shore D hardness of about 75 and is further is resistant to solvents and standard ink constituents.

Current US Cross Reference Classification (2):

101/376

CLAIMS:

4. The sleeve of claim 1 wherein the compressible material is polyurethane having a wall thickness ranging from about 1.5 mm to about 2.0 mm and a density of about 0.4 g/cm.sup.3.

5. The sleeve of claim 1 wherein the foam material is fabricated from polyurethane having a density of about 0.15 g/cm.sup.3.

6. The sleeve of claim 1 wherein the casting compound is a polyurethane casting compound with a density of about 1.2 g/cm.sup.3 and a Shore D hardness of about 75.

9. A sleeve for a printing roll comprising:

a base sleeve comprising a first end, a second end and an inside surface disposed therebetween, the inside surface of the base sleeve defining a tapered inside diameter of the base sleeve wherein the base sleeve is conical in shape with the inside diameter at the first end of the base sleeve being larger than the inside diameter at the second end of the base sleeve,

the base sleeve further comprising an outer surface with a layer of compressible material attached to the outer surface of the base sleeve, the layer of compressible material being polyurethane having a wall thickness ranging from about 1.5 mm to about 2.0 mm and a density of about 0.4 g/cm.sup.3, a layer of foam material attached to the layer of compressible material the foam material being fabricated from polyurethane having density of about 0.15 g/cm.sup.3, the layer of foam material being coated with a layer of casting compound, and a layer of engravable copper material attached to the layer of casting compound.

11. The sleeve of claim 9 wherein the casting compound is a polyurethane casting compound with a density of about 1.2 g/cm.sup.3 and a Shore D hardness of about 75.

14. A sleeve for a printing roll comprising:

a base sleeve comprising a first end, a second end and an inside surface disposed therebetween, the inside surface of the base sleeve defining a tapered inside diameter of the base sleeve wherein the base sleeve is conical in shape with the inside diameter at the first end of the base sleeve being larger than the inside diameter at the second end of the base sleeve,

the base sleeve further comprising an outer surface with a layer of compressible material attached to the outer surface of the base sleeve, a layer of foam material attached to the layer of compressible material, the layer of foam material being coated with a layer of casting compound, the casting compound being a polyurethane casting compound with a density of about 1.2 g/cm.sup.3 and a Shore D hardness of about 75, and a layer of engravable copper material attached to the layer of casting compound.

16. The sleeve of claim 14 wherein the compressible material is polyurethane having a wall thickness ranging from about 1.5 mm to about 2.0 mm and a density of about 0.4 g/cm.sup.3.

17. The sleeve of claim 14 wherein the foam material is fabricated from polyurethane having a density of about 0.15 g/cm.sup.3.

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